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NEW IMPROVEMENTS OF *Planting* and *Gardening*, BOTH Philoſophical *and* Practical.

EXPLAINING

The MOTION *of the* SAP *and* GENERATION *of* PLANTS:

With other Diſcoveries never before made Publick, for the Improvement of Forreſt-Trees, Flower-Gardens, or Parterres; with a New Invention whereby more Deſigns of Garden Platts may be made in an Hour, than can be found in all the Books now extant. Likewiſe ſeveral rare Secrets for the Improvement of Fruit-Trees, Kitchen-Gardens, and Green-houſe Plants.

> *Agite, O Adoleſcentes, & antequam Canicies vobis obrepat,* Stirpes *jam alueritis, quæ vobis, cum inſigni* utilitate, delectationem *etiam adſerent.*
>
> Pet. Bellonius, de neglectâ Stirpium culturâ.

By *RICHARD BRADLEY,* Fellow of the ROYAL SOCIETY.

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MVSEVM
BRITAN
NICVM

To the Moſt High, Puiſſant, and Moſt
Noble **PRINCE**

HENRY,

Duke, Marquis, and Earl of *Kent*, Earl
of *Harrold*, Vicount *Goodrich*, Baron
Lucas of *Crudwell, &c.* Lord-Steward
of His Majeſty's Houſhold, Conſtable
of *Windſor* Caſtle, and Lord Warden
of *Windſor* Foreſt, Lord-Lieutenant
and *Cuſtos Rotulorum* of the County of
Bedford, one of the Lords of His
Majeſty's Moſt Honourable Privy-Council, and Knight of the Moſt
Noble Order of the Garter.

My LORD,

YOUR Grace's Generous Encouragement of whatever may advance the Good of your Country, gave me the firſt Thought of inſcribing theſe Papers to your great Name; and it is with Pleaſure that I mention your Grace's Permiſſion to make Uſe of that Patronage which my Ambition firſt led me to. I am too well acquainted with your great Attainments in all kinds of Learning to offer any conjectural Projects, or vain Hypotheſes, to ſo penetrating a Judgment; theſe Sheets are the reſult of many Years Experience, the only Foundation which ſuch accurate Philoſophers as your Grace will allow for the Improveprovement of Natural Knowledge. It is a great Happineſs when Men of your exalted Quality and large Fortunes honour the Sciences, not only with your Protection, but by being Maſters of them become their Ornaments. Thus, my Lord, you are to our Studies in a way of Art, what the *Sun* is to the Subject of them in a natural way, which tho' placed at infinite Diſtance from the *Plants* of the *Earth*, yet by its Influence gives them Warmth, Action, Life and Beauty.

May it pleaſe your Grace,

Inſtead of enumerating the ſeveral Virtues of your illuſtrious Houſe, and your own, which the Publick know already; I beg leave to Congratulate my Country, upon the noble Spirit your Grace has always ſhewn in doing it the moſt important Services. The Men of Buſineſs, and the Men of Letters, the *State* and the *Societies* of Learning, are equally your Debtors. For my own part, tho' the meaneſt among the latter, I ſhall endeavour from your Influence to proſecute the Subject I have here begun, with new Vigour, humbly hoping to approve my ſelf, what I moſt deſire to be thought,

Your GRACE'*s*

Moſt Obliged and moſt

Obedient Humble Servant,

Richard Bradley.

THE

PREFACE.

AS there is no Subject of more General Uſe and Advantage than the Cultivation of Land, and the Improvement of the Vegetable World, ſo there is none which has been treated of more largely, and fell under ſuch a Variety of Pens of all kinds. The Publick, which is generally ſo good-natur'd on this Occaſion as to accept and encourage any thing that looks towards the bettering their Fortunes, has never been ſo much baulked in their Expectations as in Books of Agriculture. The Reaſons of which are, that ſome of theſe Writers have beſtowed their Pains in Collecting from Antiquity and foreign Soils, and thought they had perform'd great Matters by heaping together a load of Obſervations

vations from Varro *and* Pliny, *without carefully conſidering wherein their Experiments differ from the Genius of our* Soils *and* Climates: *Others have employ'd their time in copying from our old* Engliſh *Syſtems, and theſe have generally tranſcrib'd one another without the leaſt acknowledgment of their Thefts, or adding one ſingle Improvement to the Knowledge of their Fore-fathers. And indeed, how ſhould it happen otherwiſe, when the Undertakers of this Subject have generally been either Covetous or Illiterate* Gardeners *and* Planters; *ſome that if they knew any thing New or Curious had not the Spirit to communicate their Notions; and ſome that jogged on in the old beaten Track, without any Ambition to excel their Predeceſſors. We have now and then, it is true, a* Gentleman *Studious and Capable of obliging the World, free from the narrow Views of Self-Intereſt, and employing his Hours for a more diffuſive Benefit than the Culture of his own private Eſtate or*

Garden; *an* Evelyn, *a* Nourſe, *and a* Laurence *have given us ſomething equally* New *and Juſt, built upon Experiment, upon the beneficial Subject of* Plantation. *But what are theſe when compared to that uſeleſs Number of unimproving Authors!*

Apparent rari nantes in gurgite Vaſto.

For my own part, I muſt confeſs that I have been a long time waiting for a Compleat Syſtem of Agriculture, *and have read many a fair promiſing Title, but have found nothing within but a barren bulk of old Repetitions. This has excited me, who from a Natural bent of Genius, even from my Childhood, have had a paſſion for* Gardening *and* Planting; *to reduce all my Notions and Obſervations into a regular Form, and endeavour to ſupply this General, and ſo much lamented Defect of other Writers, I ſhall think without Vanity, that I may do my Country no inconſiderable Service,* *if I can excite the Nobility and Gentry of the Kingdom to early* Plantations *upon their Eſtates, which I ſhall prove will not only redound to their own private Profit, but the Advantage of the Nation in General. The Diſuſe of this Method was complain'd of by Mr.* Evelyn, *who ſays very juſtly,* There is no part in Huſbandry which Men commonly more fail in, neglect, and have cauſe to repent of, than that they did not begin Planting betimes. *And indeed ſuch Perſons who have been Deaf to Demonſtration at the firſt Poſſeſſion of their Eſtates, and are afterwards convinced of the vaſt Advantages to be reaped by an early* Plantation, *either from the Experience of their Neighbours or themſelves, muſt have a very pungent retroſpect upon this occaſion. Every Man is naturally willing to enjoy the Profits of the Works (as one may call them) of his own Hands, and he therefore who begins at Fifty to be ſenſible that he has loſt many a fair* Thouſand *by his neglect of improving his Eſtate between Twenty and* *his preſent Age, is to himſelf indeed a Looſer, but a Warning to others to avoid that Folly.*

To begin then as Methodically as I can, and take in all that relates to this Subject, I ſhall fairly tell my Reader what he is to expect in this First Part, *and I hope he will pardon me if I mix a little Natural Philoſophy, ſuch as is plain, eaſy, and grounded upon my own Experience, with theſe Obſervations on* Gardening *and* Planting.

I ſhall then advance (what I think) a new Syſtem of Vegetation, and endeavour to prove that the Sap *of* Plants *and* Trees *Circulate much after the ſame manner as the Fluids do in Animal Bodies, which may be one Argument to ſhew the beautiful Simplicity of Nature in all her Works.*

The Generation of Plants *will next be conſider'd, and the manner how their Seeds are impregnated, a Diſcovery which I made ſome Years ſince; this will be of great Uſe to all* Planters, *by directing them in the proper choice of their Seeds.*

The Difference of Soils will make another conſiderable Article, what are Natural to each Tree, and how all kinds of Soils may be mended, alter'd, or improved by proper Mixtures with each other; a part of Husbandry that has as yet been but ſlightly touched upon, and yet the Whole depends chiefly upon it.

The Method of Dreſſing of Woods, *and making* Plantations *of* Timber-Trees, *naturally follows; wherein I ſhall propoſe a new, eaſy, and practical way of raiſing Woods, with very little Expence, which I hope will take off thoſe Fears which the Generality are taught to conceive of the preſent great Charge of* New Plantations.

And for the further Encouragement of all Gentlemen who propoſe an Advantage from their Woods, I ſhall add an Eſtimate of the Profits that will arrive from an Acre of Land planted with Timber *and* Underwood *in* 9 *Years,* 17 *Years, and* 25 *Years after planting, which I ſhall prove will amount to above* 250 l. *beſide the Timber growing.*

Having now laid my Scheme before the Publick, I have nothing more to do than invite all Gentlemen who are Curious in this way, to communicate their Obſervations upon any of theſe Heads, and whether they agree with, or contradict my own, I ſhall think my ſelf obliged to do them Juſtice in my following Papers. I can only ſay, that this is a Subject which I have long Study'd and Experienc'd; and a ſlight or ſingle Obſervation ought to be no Foundation to build a new Syſtem upon, or overthrow an old one. An Undertaking of this kind, which aims directly at the Good of others, I hope therefore will meet with little Cenſure and leſs Diſcouragement.

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NEW IMPROVEMENTS OF *Planting* and *Gardening*, BOTH Philoſophical *and* Practical.

CHAP. I.

A Parallel between Plants and Animals; with an Attempt to prove the Circulation of the Sap in Vegetables.

VEgetation, in what-ever Degree I ſhall treat of it, is equally depending on the Order of Nature. Whether I ſpeak of *Trees*, *Shrubs*, or *Herbaceous Plants*, their Principles are equally the ſame: that is to ſay, they all alike draw their Nouriſhment by way of their *Roots*; which Nouriſhment

riſhment is convey'd through proper Veſſels into the *Stem*, the *Branches*, *Leaves*, *Flowers* and *Fruit*.

Now that I may more eaſily explain by what Means every *Plant* receives and diſtributes its Nouriſhment to the ſeveral Parts of it, give me leave to draw a Parallel between *Plants* and *Animals*, that thereby the Nature of *Plants* may be the better underſtood.

The many curious Obſervations which have been made concerning the Structure of *Animal* Bodies, and what *Malpigius*, Dr. *Grew*, and my ſelf have remark'd in the Structure of *Vegetables*, may aſcertain to us, that Life, whether it be *Vegetable* or *Animal*, muſt be maintain'd by a due Circulation and Diſtribution of Juices in the Bodies they are to ſupport; we have all alike diſcover'd (with the help of *Microſcopes*) the ſeveral Veſſels, and other Parts which compoſe a *Plant*; but I cannot agree in Opinion with the Authors I have mention'd concerning the Courſe of the Juices thro' the Ducts and Channels which we have diſcover'd. It would be needleſs for me in this Place to relate their ſeveral Opinions, which would ſwell this Treatiſe to too great a Bulk; their Works may be peruſed by the Curious; I ſhall proceed to explain, that the *Sap* Circulates in the Veſſels of *Plants*, as the *Blood* doth in the Bodies of *Animals*.

And that this new Syſtem may be the better underſtood, I think it proper in this Place to give a ſhort Deſcription of the Veſſels in *Plants*, and their Situation. Firſt then the *Root* of a *Plant* is of a ſpungy Nature, ready to admit into it ſuch humid Particles as are fitted (in the Earth, by a certain Temperature of Air) to be received into its Pores: and we may obſerve that the various Qualities of different *Plants* depend chiefly on the different Size of the Pores in their *Roots*, by which they receive their ſeveral Nouriſhments.

Secondly, We muſt underſtand that the Wood of every *Plant* is compoſed of Capillary Tubes running parallel with each other, from the *Root* (upright) through the *Trunk*. Their Cavities are ſo ſmall that they are hardly to be diſcern'd by the natural Eye, unleſs in a Piece of Charcoal, Cane, or Oaken Board: theſe Veſſels renew and augment themſelves every Year, as we may obſerve by cutting a *Tree* Horizontally, which will diſcover to us the Latitudinal Shootings, and the annual Additions of theſe Pipes, and for which Reaſon the *Trunks* of *Trees* increaſe in their Circumference. Theſe Tubes for Diſtinction ſake I ſhall call *Arterial Veſſels*. For it is through theſe the *Sap* riſes from the *Root* in fine *Vapour*; for their Cavities are ſo ſmall that it would be impoſſible they ſhould admit any thing whoſe Parts were ſo large as thoſe of a *Liquor*.

Thirdly, The Paſſages, or Pipes, by which the *Sap* returns downward, are much more open than the former, and are capable of receiving a Liquor into them; theſe are placed immediately on the Outſide of the *Arterial Veſſels* between the *Wood* and inner *Bark*, and lead down directly to the Covering of the *Root*. They perform the Office of *Veins*, and contain the liquid *Sap* which is found in *Plants* in the Spring and Summer Months.

Fourthly, The *Bark* of a *Tree* is of a ſpungy Texture, and by many little Strings which paſs between the *Arterial* Pipes, correſponds with the *Pith*. And,

Fifthly, The *Pith* is compoſed of little tranſparent Globes chain'd together in like Manner with thoſe Bubbles which compoſe the Froth of any Liquor.

In fine, a *Plant* is like an *Alimbeck*, which diſtils the Juices of the Earth; as for Example.

The *Root* having ſuck'd in the Salts of the Earth, and thereby fill'd it ſelf with proper Juices for the Nouriſhment of the *Tree*; theſe Juices then are ſet in Motion by Heat, that is, they are made to evaporate into *Steam*, as the Matter in a Still will do when it begins to warm; now ſo ſoon as this *Steam* or *Vapour* riſes from the *Root*, its own natural Quality carries it upwards to meet the Air; it enters then the Mouths of the ſeveral *Arterial Veſſels* of the *Tree*, and paſſeth up them to the Top with a Force anſwerable to the Heat that put it in Motion, by this Means it opens (by little and little as it can force its way) the Minute Veſſels which are roll'd up in the *Buds*, and explain them by degrees into *Leaves*.

But as every *Vapour* of this kind when it feels the Cold will condenſe and thicken into a Water, ſo when the *Vapour* which I mention to riſe thro' the *Arterial Veſſels* arrives at the extream Parts of them, (*i.e*) the *Buds* of a *Tree*, it there meets with Cold enough to condenſe it into a *Liquor*, as the *Vapour* in a Still is known to do.

In this Form it returns by Means of its own Weight to the *Root* down the *Veſſels* which do the Office of *Veins*, lying between the *Wood* and inner *Bark*; leaving, as it paſſeth by, ſuch Parts of its Juice as the Texture of the *Bark* will receive, and requires for its Support.

It may be wonder'd at that I have not taken more Notice of the *Pith* which has been always accounted the principal Part of a *Tree*; to which I ſhall only anſwer at this Time, that many *Herbaceous Plants* have not any *Pith*, and that I have ſeen the *Trunks* of large *Trees* deſtitute of it, and they have yet continued to grow and to bear *Fruit*, ſo that the Order of *Vegetation* may be explain'd without it; and indeed was I here to take Notice of the ſeveral Particulars in *Plants*, I might ſwell this Treatiſe into a large Volume; but I am clearly of the ſame Opinion with him that ſaid, μέγα βίϐλιον μέγα κάκον; and therefore ſhall confine my ſelf in this Work to ſuch Relations only, as I hope may be Uſeful.

But to proceed: The following Experiment of the moſt Ingenious Mr. *Lawrence*, which he has mention'd in his *Clergyman's Recreation*, relating to the Jeſſamine, may convince us of the Certainty of the *Sap's* Circulation in *Plants*. I ſhall give it in his own Words, “Suppoſe
“ a plain *Jeſſamine Tree* ſpreading
“ it ſelf into two or three *Branches* from
“ one common *Stem* near the *Root*. Into
“ any one of theſe *Branches*, in *Auguſt*,
“ inoculate a *Bud* taken from a yellow
“ ſtrip'd *Jeſſamine*, where it is to abide
“ all Winter, and in the Summer,
“ when the *Tree* begins to make its
“ Shoots, you will find here and there
“ ſome *Leaves* ting'd with Yellow, even
“ on the other *Branches* not inoculated,

" till by Degrees, in ſucceeding Years, " the whole *Tree*, even the very *Wood* " of all the tender Branches, will be " moſt beautifully ſtrip'd and dy'd with " Yellow and Green intermix'd; *he adds*, " that tho' the inoculated *Bud* ſhould not " ſhoot out, or that it ſhould live but " two or three Months, and after that " happen to die or be wounded by Ac- " cident, yet even in that little Time " it will have communicated its Virtue " to the whole *Sap*, and the *Tree* will " become entirely ſtrip'd." And this Experiment my ſelf and ſeveral others have made ſeveral Years ago; it gave me the firſt Hint of the *Sap's* Motion, and put me upon further Enquiry, it may I hope ſatisfy the Curious.

The Motion of the *Sap* continues in a *Plant* ſo long as the Sun's Warmth can keep it in a fluid State, but is condenſed or thicken'd by a Winter's Cold, and is thereby changed into the Conſiſtency of Gum, and being thus ſtagnated, cannot move any more till the Warmth of the following Spring, or ſome artificial Heat, rarifies it into its former liquid State.

It then renews its former Vigour, and puſhes forth *Branches*, *Leaves*, *&c.* But we muſt not ſuppoſe it is only the melted *Sap* that does that Office of *Germination*, the *Root* has not been idle while the *Branches* have ſtood ſtill, it has not loſt the Moiſture of the preceding Autumn to impregnate and furniſh it ſelf with proper Salts or Nouriture; from whence the *Tree* is to be maintain'd. Here is a Supply laid in to furniſh Food for the Summer, as ſome induſtrious *Animals* will do to nouriſh themſelves in the Winter.

In the next Place it may not be amiſs to confute a common Opinion, *That the* Sap *returns to the* Root *in Winter*; for if it did ſo, how comes it that *Trees* which are cut down in *November* and *December* will put forth *Branches* and *Leaves* the following Spring, altho' they have no *Root* or Earth to feed them? this plainly ſhews that the *Sap* is condenſed or thicken'd in the *Tree* during its Circulative Courſe by extream Cold, and remains in that gummy State, 'till the Warmth of the Spring (as I have already ſaid) liquifies it, and by the *Vapour* which muſt then ariſe from it, the *Buds* are puſh'd forth, ſo long as there is Matter ſufficient to furniſh them.

And now ſince it appears from what has been ſaid, that *Plants* have a Circulation of *Sap*, and proper Means whereby to ſupply themſelves with *Food*, let us conſider whether *Plants* in their ſeveral Kinds do not require different Sorts of *Food* one from the other, like various ſorts of *Animals* which differ in their *Dyets.*

Firſt then, *Land Animals* may be liken'd in general to thoſe *Plants* which are call'd *Terrene*, for that they live only upon the Earth, ſuch as *Oaks*, *Beech*, *Elm*, &c.

Amphibious Animals, ſuch as the *Otter*, *Beaver*, *Tortoiſe*, *Froggs*, &c. which live as well on the Land as in the Waters, may be compared to the *Willow*, *Alder*, *Minths*, and ſuch others.

The *Fiſh Kind*, or *Aquatick Race*, whether of the *Rivers* or the *Sea*, are analogous to the *Water Plants*, ſuch as *Water Lillies*, *Water Plantains*, &c. which only live in *Rivers* or *Freſh Water*, or the *Fuci*, *Coral*, *Coraline*, &c. which are Sea or Salt Water *Plants*; and not any one of thoſe will live out of its proper Element. From whence we may conclude, how improper it would be to plant a *Water Lilly* in a dry ſandy Deſart, or an *Oak* at the bottom of the Sea, which would be juſt as unreaſonable as if we ſhould propoſe to feed a *Dog* with *Hay*, or a *Horſe* with *Fiſh*; however, this Rule of Nature has been ſo little obſerv'd even by ſome of our greateſt *Planters*, that we can hardly boaſt of good Succeſs in one out of five *Plantations* that has been made.

But I ſhall beg Leave to remark yet further, That as the ſeveral *Land Animals* have their reſpective *Dyets*, ſo have the *Terrene Plants* likewiſe their ſeveral *Soils* from whence they draw their Nouriſhment; as ſome *Animals* feed on *Fleſh*, others on *Fiſh*, *Roots*, *Leaves*, *Grain* or *Fruits*, ſo do we find that ſome *Plants* love *Clay*, others a *Loam*, *Sand*, or *Gravel*, &c. Nor is this all we ought to obſerve, we muſt conſider likewiſe how beneficial to every *Plant* is a right Expoſure, whether in a *Vale*, the ſides or tops of *Hills*, expoſed to the *South* or *North* Winds, whether inland, or near the Air of the *Sea*; for it is a proper *Air* that keeps a *Plant* in Health, and fits it to receive its Nouriſhment, and a certain degree of *Warmth*, peculiar to each kind of *Plant*, is likewiſe worth our Enquiry, for it is a *Warmth* natural to each *Plant* that puts its *Juices* in their proper Motion; but this may be more fully explain'd in another Place; in the mean while I ſhall proceed to examine, in the next Chapter, by what Means *Plants* are capable of *Generating*, and to explain the Uſes of that Diſcovery.

CHAP. II.

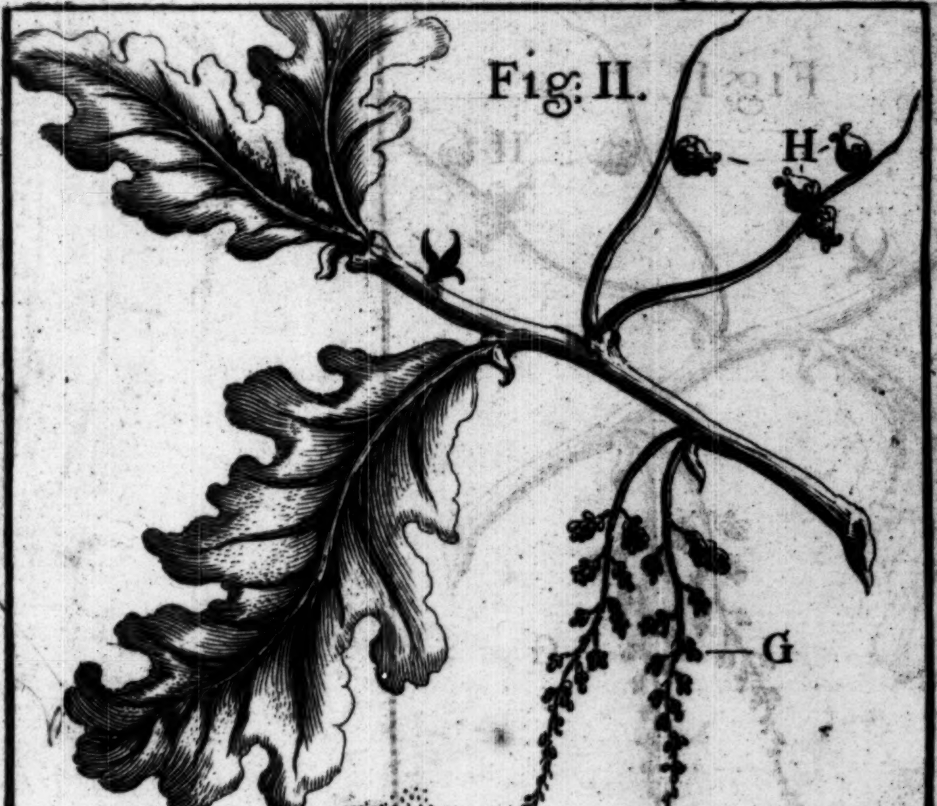
Of the Generation of PLANTS.

IN the foregoing Chapter I have given my Reader ſuch Hints as may ſerve to explain my *Syſtem of the Circulation of Juices in Vegetables*, and have endeavour'd to ſhow that *Plants* are ſomewhat analogous to *Animals*; I ſhall now proceed to offer another Diſcovery, as new as the former, and depending on it, which I conceive will be of extraordinary Uſe to ſuch as raiſe Plantations from *Nutts*, *Maſt*, or any other kind of *Seed* or *Grain*. And altho' in this Treatiſe I have propoſed to give ſome Directions tending only to the Improvement of *Forreſt* and *Timber Trees*, yet I hope to be excuſ'd, if in the Explanation of this wonderful Myſtery of the *Generation of Plants*, I ſhall be forced to introduce ſuch kinds of *Plants* as are not to be found in *Forreſts*, and to make ſome of my Experiments in the *Orchard* or *Kitchen-Garden*.

Moſes tells us in his Account of the *Creation*, That *Plants have their Seeds in themſelves*; that is, every *Plant* contains in it ſelf Male and Female Powers; the Text he has given us ſeems to be explain'd by this Diſcovery, and may lead us to conſider that *Plants* wanting *local Motion*, require therefore this Union of *Sexes* in themſelves, by which Means they may generate without the Neighbourhood of other *Plants*; they are in this reſpect like *Muſcles*, or other immovable Shell-fiſh, who are *Hermaphrodites* of this kind, having their Propagation without the help of one of the ſame Species. I mention *Muſcles* and other Immovable Kinds of *Shell-fiſh* as a particular kind of *Hermaphrodites*, for thoſe which have local Motion, ſuch as *Snails* and *Earth-Worms*, when they couple with one another, at once perform the *Male* and *Female* Act of *Generation*.

But before I proceed to explain this New Syſtem, I think my ſelf obliged to declare that the firſt Hint of this Secret was communicated to me ſeveral Years ago by a worthy Member of the *Royal Society*, *Robert Balle*, Eſq; who has had this Notion for above Thirty Years, that *Plants* had a Mode of *Generating* ſomewhat analogous to that of *Animals*. The Light which I received from this Gentleman was afterward farther explain'd by another Learned Member of that Society, Mr. *Samuel Moreland*, who in *Phil. Tranſ.*

Numb.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BRITISH MUSEUM

Numb. 287, *Anno* 1703, has given us to underſtand how the *Duſt* of the *Apices* in *Flowers* (*i e.* the *Male Sperm*) is convey'd into the *Uterus* or *Vaſculum Seminale* of a *Plant*, by which Means the *Seeds* therein contain'd are *impregnated.* I then made it my Buſineſs to ſearch after this Truth, and have had good Fortune enough to bring it to Demonſtration by ſeveral Experiments; ſince which, a Gentleman of *Paris* has printed ſomething of the ſame Nature, in the *Hiſt. de l'Accad. de Sciences*, for the Years 1711 and 1712, which were publiſhed about two Years ago.

But to come to the Point, the *Lilly* being a Flower more generally known than any other, and its Generative Parts being large and expoſed, I ſhall from thence endeavour to explain the Method which Nature makes uſe of to impregnate the *Seeds* of *that* and every other *Plant*, and by which Means the ſeveral *Species* of *Vegetables* have been continued to the World.

The *Flower* of the *Lilly* has ſix *Leaves* or *Petals*, which are ſet on upon the Summit of the *Footſtalk*, mark'd *A* in the firſt Figure, they ſerve to guard the Parts of Generation from the Injuries of the Weather, and as they are of no other Uſe that I know of, ſo it is not neceſſary that I ſhould place them in the Figure.

B is the Mouth of the *Piſtillum* or Paſſage which leads into the *Uterus C*, in which are three *Ovarys* fill'd with little *Eggs* or *Rudiments* of *Seeds*, ſuch as we find in the *Ovaria* of *Animals*, but theſe *Eggs* will decay and come to nothing, unleſs they are impregnated by the *Farina Fecundans* or *Male Seed* of the ſame *Plant*, or one of the ſame ſort.

From *D* to *E* is a *Stamen* of the *Lilly*, thro' which the *Male Seed* of the *Plant* is convey'd to be perfected in the *Apex F*, where, by the Sun's Heat it ripens and burſts forth in very minute Particles like *Duſt*; ſome Particles of which *Powder* falling upon the Orifice *B*, is either convey'd from thence into the *Utricle C*, or by its magnetick Virtue draws the Nouriſhment with great Force from the other Parts of the *Plant* into the *Embrio's* of the *Fruit*, and make them *ſwell*.

Now that the *Farina Fecundans* or *Male Duſt* has a Magnetick Virtue, is evident, for it is that only which *Bees* gather and lodge in the Cavities of their hind Legs to make their *Wax* with; and it is well known, that *Wax*, when it is warm, will attract to it any light Body. But again, if the Particles of this *Powder* ſhould be requir'd by Nature to paſs into the *Ovarys* of the *Plant*, and even into the ſeveral *Eggs* or *Seeds* there contained, we may eaſily perceive, if we ſplit the *Piſtillum* of a *Flower*, that Nature has provided a ſufficient Paſſage for it into the *Uterus*.

In the firſt Figure I have only given a Deſign of one *Stamen* with its *Apex*, to prevent Miſtakes in my Explanation, but the *Flower* of every *Lilly* has ſix of the ſame Figure and Uſe, which are placed round about the *Piſtillum* or Female Parts; ſo that 'tis almoſt impoſſible it ſhould eſcape from receiving ſome of the *Male Duſt* (or *Farina Fecundans*) falling upon it.

In this and other *Flowers* of the like Nature the *Piſtillum* is always ſo placed that the *Apices* which ſurround it are either equal in Height with it, or above it, ſo that their *Duſt* falls naturally upon it. And when we obſerve it to be longer than the *Apices*, we may then conjecture that the *Fruit* has began to form it ſelf, and has no longer occaſion of the *Male Duſt*. And it is likewiſe obſervable that ſo ſoon as this Work of *Generation* is perform'd, the *Male Parts*, together with the *Leaves* or *Covering* fall off, and the *Pipe* leading to the *Uterus* begins to ſhrink.

We may further remark, That the top of the *Piſtillum* in every *Flower* is either cover'd with a ſort of Velvet Tunic, or emitts a gummy Liquor the better to catch the *Duſt* of the *Apices*.

And now as we may find in the Deſcription I have given of the *Lilly*, that the *Uterus* is within the *Flower*; ſo on the other Hand the *Uterus* of a *Roſe* is without the *Flower* at the bottom of the *Petals* or *Flower-Leaves*. And likewiſe in *Fruit Trees*, the *Cherrys*, *Plums*, and ſome others, have their *Utricles* within their *Flowers*, and the *Goosberry*, *Currant*, *Apples* and *Pears*, on the outſide or bottom of their *Flowers*. But farther, altho' Nature has deſign'd the *Duſt* of the *Apices* to fecundate the *Female Parts* contain'd in the *Flowers* of *Plants*; yet we obſerve that in ſome *Plants* the *Male* and *Female Parts* are remote from each other; as for Example, the *Gourd*, *Pumpkin*, *Melon*, *Cucumber*, and all of that Race, have *Bloſſoms* diſtinctly, *Male* and *Female*, upon the ſame *Plant*. The *Male Bloſſoms* may be diſtinguiſhed from the others, in that they have not any *Piſtil* or Rudiment of *Fruit* about them, but have only a large *Thrum* cover'd with *Duſt* in their middle; the *Female Bloſſom* of theſe has a *Piſtillum* within the *Petals*, or *Flower Leaves*, and the Rudiment of their *Fruit* always apparent at the bottom of the *Flower* before it opens; and ſo in like manner all *Nut-bearing*, and, I think, *Maſt-bearing Trees* have their *Catkins* or *Male Bloſſoms* remote from the *Female Parts*.

The *Oak* for Example, which bloſſoms in *May*, has its *Male Parts* diſtinct from the *Acorns*, we find Strings of little *farinaceous Flowers* in great Abundance, as in the Second Figure, mark'd *G*, remote from the Rudiments of the *Acorns* or *Fruit* mark'd *H*: And ſo likewiſe in the *Walnut*, *Cheſtnut*, *Hazel*, *Pine*, *Cypreſs*, and even the *Mulberry*, *Aſpen*, and others. I have obſerv'd that ſome Sorts of *Willows* change their Sex every Year, by producing only *Male Bloſſoms* or *Katkins* one Year, and the other following *Strings* of *Female Bloſſoms*, which if they then happen to be near enough ſome *Flow'ring Male*, will produce *Seeds* not much unlike thoſe of an *Apocinum*.

When we view with a good *Microſcope* the *Male Duſt* of one ſingle *Plant*, we find every Particle of it to be of the ſame Size and Figure, but in ſome Caſes, it is of two Colours, as in the *Tulip*, where it is Yellow and Blue; but as *Plants* differ from one another in their Figures and Qualities, ſo are the Figures of their ſeveral *Duſts* greatly different from each other; a Grain of the

Duſt of *Geranium Sanguineum, Maximo flore* of *C, B, P,* is like a Bead of a Necklace with a Hole thro' it.

The *Farina* of the *Corona Solis perennis Flore & Semine Maximus. Hort. Ludg. Bat.* is a Globe ſet with Thorns; that of the *Ricinus Vulgaris, C, B, P,* is of the Figure of a Grain of Wheat.

And the *Acer Montanum Candidum* of *C, B, P,* affords a *Duſt* of the Figure of a Croſs; and in like manner does the *Farina* of every *Plant* differ in its *Shape* from the reſt.

The Female Parts of *Generation* in *Plants* are beſt ſeen in large *Fruits,* without the trouble of the *Microſcope*; ſuch as the *Fruit* of the *Pumpkin* or *Melon,* where with the Natural Eye we may diſcover the *Veſſels* diſtinctly which make the *Tunick* or *Covering* of each *Ovary*; we may ſee how the *Seeds* are joyn'd to it, and by what End they receive their Nouriſhment. And again, between the ſeveral *Ovarys* enclos'd in that *Fruit,* we may very eaſily perceive the *Vagina,* or Paſſage through which the *Farina Fecundans* has paſs'd to impregnate the *Seeds.*

It may perhaps be objected againſt this *Hypotheſis,* that there are many *Flowers* which hang downwards, as the *Crown Imperial,* the *Cyclamen,* &c. and that their *Piſtils* cannot receive the *Farina Fecundans*

dans upon them; but if we obſerve that the *Piſtils* of theſe *Flowers* are always more prominent or ſomewhat longer than the *duſty Apices* which ſorround them, we may eaſily conceive that the glutinous Matter and Velvet Covering on the Extremities of the *Piſtils*, may be capable enough of receiving and holding ſome of the *Powder* as it falls; and whether the Intromiſſion of the *Farina Fecundans* be requiſite or not, its Lodgment on the Mouth of the *Piſtillum* may, by Virtue of its attractive Quality, perhaps fecundate the *Seeds* contain'd in the *Vterus*; I am ſure in the Production of *Animals* there are yet greater Difficulties to encounter with, and it may be if the *Analogy* between *Plants* and *Animals* was more enquir'd after by the Learned, they might diſcover many new Things which would be ſerviceable to the Preſervation and Benefit of *Animal Bodies*, as this Knowledge will be to the Improvement of the *Vegetable World.* We find, for Example, that *Trees* are generally longer lived than *Animals*, ſome of them living to four or five Hundred Years; nay, we have ſome Accounts by Tradition, of *Trees* that have liv'd above 2000 Years; the Reaſon I think is plain, for that, *Firſt*, *Trees* have no Senſation (for it is my Opinion, that the *Senſes* prey abundantly upon on the *Juices* of the *Body* they belong to). *Secondly*, They always breathe the ſame Air: And, *Thirdly*, They feed always upon the ſame ſimple *Dyet*. And Mankind, who in the firſt Times is ſaid to have lived upwards of 900 Years, is ſaid to have fed upon a *Simple Dyet*, and to have drank of the *clear Stream*; at leaſt he had then but little Variety of Food. But I hope my Reader will pardon this Digreſſion of mine, it may perhaps put him upon greater Diſcoveries.

I ſhall now proceed to what I call the *Demonſtrative Part* of this *Syſtem*. I made my firſt Experiment upon the *Tulip*, which I choſe rather than any other *Plant*, becauſe it ſeldom miſſes to produce *Seed*. Several Years ago I had the Conveniency of a large Garden, wherein there was a conſiderable Bed of *Tulips* in one Part, containing about 400 Roots; in another Part of it, very remote from the former, were Twelve *Tulips* in perfect Health, at the firſt opening of the Twelve, which I was very careful to obſerve, I cautiouſly took out of them all their *Apices*, before the *Farina Fecundans* was ripe, or any ways appear'd; theſe *Tulips* being thus *caſtrated*, bare no *Seed* that Summer, while on the other hand, every one of the 400 *Plants* which I had let alone produced *Seed*.

But as a farther Demonſtration that *Plants* generate after the manner I have endeavoured to account for it, I ſhall recommend to my Reader the following Experiment. Make Choice of ſuch a *Plant* of the *Hazel* or *Philbud*, as you find to be in a bearing State, and far diſtant from any other of the ſame Sort; this *Tree* in *January* puts forth what are commonly call'd *Catkins*, which are long *Thrums*, compos'd of very ſmall *Flowers*, that towards the beginning of *March* are cover'd with a fine *Duſt*, or *Male Seed*; 'tis then the *Bloſſoms* or *Female Parts* appear on the *Buds* of the ſame *Tree*; they are very ſmall, and hardly to be diſcern'd without ſtrict Enquiry, only offering to the View a ſmall cluſter of *Scarlet Threads*, which are ſo many *Tubes* leading to the Rudiments of the *Nutts*; this happens at a windy Seaſon of the Year, that the *Male Duſt* may be more eaſily convey'd to the *Utricles* or *Female Bloſſoms* of the *Plant*. Now ſo ſoon as the *Catkins* appear, they muſt be carefully taken from the *Tree*, and it will produce no *Fruit* that Year, unleſs you have a mind to ſingle out any particular *Bloſſom* of it, which may be impregnated with *Catkins* from another *Tree*, gather'd freſh every Morning for three or four Days ſucceſſively, and duſted lightly over it, without bruiſing its tender *Fibers*: And in like manner may the *Bloſſoms* of any other *Tree* or *Flower* be *caſtrated*, and will have the ſame Effect.

By this Knowledge we may alter the Property and Taſte of any *Fruit* by impregnating the one with the *Farina* of another of the ſame Claſs; as for Example, a *Codlin* with a *Pairmain*, which will occaſion the *Codlin* ſo impregnated to laſt a longer Time than uſual, and be of a ſharper Taſte; or if the *Winter Fruits* ſhould be fecundated with the *Duſt* of the *Summer Kinds*, they will decay before their uſual Time; and it is from this accidental coupling of the *Farina* of one with the other, that in an *Orchard* where there is Variety of *Apples*, even the *Fruit* gather'd from the ſame *Tree*, differ in their Flavour and Times of ripening, and moreover the *Seeds* of thoſe *Apples* ſo generated, being changed by that Means from their Natural Qualities, will produce different Kinds of *Fruit* if they are ſown.

'Tis from this accidental Coupling that proceeds the Numberleſs Varieties of *Fruits* and *Flowers* which are rais'd every Day from *Seed*. The yellow and black *Auricula's*, which were the firſt we had in *England*, coupling with one another, produced *Seed* which gave us other Varieties, which again mixing their Qualities in like manner, has afforded us by little and little, the Numberleſs Variations which we ſee at this Day in every curious *Flower-Garden*; for I have ſaved the *Seeds* of near a hundred plain *Auricula's*, whoſe *Flowers* were of one Colour, and ſtood remote from others, and that *Seed* I remember to have produced no Variety; but on the other hand, where I have ſaved the *Seed* of ſuch plain *Auricula's* as have ſtood together, and were differing in their Colours, that *Seed* has furniſh'd me with great Varieties, different from the *Mother Plants*. I believe I need not explain how the *Male Duſt* of *Plants* may be convey'd by the Air from one to another, by which this *Generation* and *Production* of new *Plants* is brought about; but I ſhall hint by the bye, to ſuch as plant *Orchards* for *Cyder*, that they ought to plant only one Sort of *Apple* in thoſe Orchards; and that ſuch Plantations be likewiſe remote from other Kinds of *Apples*, whoſe *Farina* would elſe certainly ſpoil the *Cyder-Fruit* by ripening ſome ſooner and others later, which would occaſion almoſt a continual Ferment in the Liquor, and never permit it to ſettle or grow fine.

Moreover, a Curious Perſon may, by this Knowledge, produce ſuch rare Kinds of *Plants*, as have not yet been heard of, by making choice of two *Plants* for his

Purpoſe, as are near alike in their Parts, but chiefly in their *Flowers* or *Seed-Veſſels*; for Example, the *Carnation* and *Sweet William* are in ſome reſpects alike, the *Farina* of the one will impregnate the other, and the *Seed* ſo enliven'd will produce a *Plant* differing from either, as may now be ſeen in the Garden of Mr. *Thomas Fairchild* of *Hoxton*, a *Plant* neither *Sweet William*, nor *Carnation*, but reſembling both equally, which was raiſed from the *Seed* of a *Carnation* that had been impregnated by the *Farina* of the *Sweet William.* Theſe Couplings are not unlike that of the *Mare* with the *Aſs*, which produces the *Mule*, and in regard to *Generation*, are alſo the ſame with *Mules*, not being able to multiply their *Species*, no more than other Monſters generated in the ſame manner.

We may learn from hence, that the *Fruit* of any *Tree* may be adulterated as well by the *Farina* of one of the ſame Sort, which perhaps may be ſickly and of a Dwarf Kind, as by the *Duſt* of ſome other Kind near a-kin to it, and worſe than it ſelf. Now as ſuch Couplings may be very frequent in common *Woods*, ſo would I recommend the Choice of *Seed*, to be made only from ſuch *Plants*, or *Timber-Trees* as excell in Greatneſs or other good Qualities, and are far diſtant from others of meaner Sorts which might degenerate their *Seeds*, and croſs our Expectations when they come to grow up, and this is as neceſſary to be obſerved among *Vegetables*, to maintain their good Qualities in the young *Plants* they are to produce, as it is in the Breeding of *Game-Cocks*, *Spaniels*, or *Running-Horſes*.

There is but one Sort of *Plant* that I know of, which ſeems to be out of this Danger of coupling with other Sorts, and conſequently of either improving or diminiſhing the Qualities of its *Seeds*, and that is the *Miſletoe*; the Parts of its Flowers are indeed as apt to *Generation* as thoſe of other *Plants*, but I have never ſeen any Variety of this *Plant*, or do I know any other nearly enough related to it to *ingender* with it; for whether we find it growing upon the *Oak*, *Willow*, *Lime*, or any other *Tree* what-ever, the *Leaves*, *Flowers*, and *Fruit*, with its manner of *Growth*, are all alike. And ſince I have had Occaſion to mention it in this Place, give me Leave to take Notice of ſome Particularities belonging to it, as that it is neither to be propagated in *Earth* or *Water*, but upon *Trees* and *Plants* only. The Ancients made it a *Superplant*, peculiar to the *Oak*, and tell us, that altho' it ſeemingly produced *Seed*, they did not believe that that *Seed* could poſſibly be made to *vegitate*, becauſe I ſuppoſe they had try'd it in the *Earth* without Succeſs. But as it is ſo frequently found *growing* on other *Trees*, beſides the *Oak* in our Times, I ſhall take Occaſion at once to overturn their Opinion in relation to this *Plant*, by ſhewing how it may be *propagated* from *Seed* upon any *Tree* what-ever. About *Chriſtmaſs* when the *Berries* are ripe, they may eaſily be made to ſtick upon the ſmooth *Bark* of any *Tree* you have a Mind to *propagate* them upon, whether it be the *Oak*, *Aſh*, *Elm*, *Apple*, *Pear*, *Plum*, *Roſe*, *Gooſeberry* or *Currant*, &c. The *Viſcous Juice*, which encompaſſeth each *Seed*, will bind it faſt to the *Part* you place it upon, and with this ſmall Trouble you may expect young *Plants* the following Year, provided the Birds don't devour the *Seeds* you have ſown, therefore a Net would do well to ſecure them. I have ſeen twenty *Plants* of *Miſletoe* growing upon as many different Sorts of *Trees* and *Shrubs* in one Garden, which were *propagated* in the ſame Manner I have mentioned. And I believe it would be very uſeful in correcting the too great Vigour of ſome *Fruit-Trees*, and bring them to bear, by taking from them the *ſuper-abundant Juices*, which are always deſtructive to *Prolificity*, either in *Plants* or *Animals*.

And now from the Account I have given of the *Generation* of *Plants* it appears that double *Flowers* ſeldom bear *Seed*, becauſe the *Duſt* of the *Apices* is too much crowded with the *Petals* or *Flower-Leaves*, which for that Reaſon cannot eaſily reach the *Style* or *Piſtil* of the *Flower* which is always prominent, and above the *Petals*, in full *Flowers*. It appears likewiſe that the Natural Properties of *Fruits* or *Seeds* may be changed by accidental coupling with other *Plants*; and that the *Seeds* ſo alter'd, may rob us of our Expectations in *Planting*, by having their Principles debauch'd by the *Duſt* of *diſtemper'd* and *degenerated Plants*. I could ſtill add many other Remarks relating to this Diſcovery, and give my Reader a more ample Deſcription of the *Generative Parts* of *Vegetables*, as I have obſerv'd them with the beſt *Microſcopes*; but I conceive I have ſaid enough to explain what I propoſed upon this Head, and ſhall therefore now proceed to offer ſuch Experiments as I have made relating to *Soils*, and endeavour to ſhew how they may be mended, alter'd, and improv'd chiefly by proper Mixtures with each other.

CHAP. III.

Of SOILS *proper for the Nouriſhment of* PLANTS, *and Compoſts for forwarding the Growth of* PLANTS.

IF *Plants* in their ſeveral Degrees draw from the *Earth* ſuch *Aliment* as is proper for their Subſiſtance, and that as the Nouriſhment they receive is more or leſs ſuitable to them, ſo they proſper accordingly; we may then reaſonably infer that there is a Circulation of *Sap* in *Vegetables*, in ſome Reſpect like that of the Blood in *Animals*, as I have already endeavour'd to ſhew in my firſt Chapter of this Tract. For in Animals it is very certain that a *Diet* is required by them, and that *Diet* being concocted, is the Matter from whence the Blood is drawn, and that as the Blood is, ſo is the State of the Body, either healthful or diſtemper'd, then it reaſonably follows that we ought as carefully to provide wholeſome and natural Nouriſhment for the Welfare of each reſpective *Plant* we deſign to *propagate*, as we uſually do the proper *Food* or *Diet* of every *Animal* we have a Mind to nouriſh. The Food of *Land Animals* is of three Kinds only, *viz.*

Fleſh, *Herbs*, and *Seeds* or *Fruit*. So likewiſe the *Food* of *terrene Plants* is of three Sorts, *Sand*, *Loam* or *Mother-Earth*, and *Clay*, in their ſeveral Degrees; and as the ſeveral Kinds of *Fleſh*, the various Tribes of *Herbs*, and the many different *Fruits* have each their reſpective *Animals* to feed upon them, ſo *Sand* in its ſeveral Degrees, *Loam* of different Sorts, and *Clays* of all Kinds have certain Proportions of *Salts* in them reſpectively, proper for the Nouriſhment of every *Plant*. *Fruit*, or *Seeds*, I eſteem to be the *Medium Nouriſhment* between *Fleſh* and *Herbs*, and we find that every Land *Animal* will feed upon it, altho' their natural *Food* is either *Fleſh* or *Graſs*; as for Example, a Horſe, whoſe proper Food is Graſs, will eat Grain, and ſo Dogs and other Creatures who feed upon Fleſh, will eat Fruit. And I am of Opinion that the *Salts* therefore of *Fleſh*, *Fruit* and *Herbs* are the ſame, only differing in the Proportions of their Quantities; that is, one Pound Weight of *Fleſh* may perhaps contain twice as many *Salts* as the like Weight of Grain or Seed, and one Pound of *Grain* twice the *Salts* as may be found in a Pound of *Herbs* or *Graſs*. Now that all theſe *Salts* are proper for *Vegetation*, is evident by the common Practice of burying *Straw*, or *Litter*, *Brakes*, *Haulm*, and ſuch like, to enrich ſome *Soils*; again if ***Fruits*** and ***Grain*** be well conſumed, one Load of it laid upon a Spot of Ground, will enrich it more than ten Load of Horſe-Litter, or Common Dung, ſays Sir *Hugh Platt* from Experience, and we are very ſenſible of the prodigious Effect of ***Carion***, ***Leather***, or any Parts of ***Animals*** apply'd to the Roots of *Vegetables*.

So on the other Hand in Natural Soils, what I call *Loam*, or *Mother Earth*; I ſuppoſe to be the *Medium* between *Sand* and *Clay*, that is an Earth of a certain Temperature, partaking equally of them both. And indeed all *Soils* that I know of, may be reduced under theſe three general Heads, *viz.* *Sand*, *Loam*, and *Clay*; for all others, altho' they may bear different Names, are in ſome Reſpect depending upon one or other of theſe. *Gravels*, and all the open *Soils*, 'till we come to the *Loam* I mention, are of the *Sandy* Race; and the binding *Earths*, from *Loam* downwards, 'till we come to the *Stiffneſs* of Chalk it ſelf, may be ranged with the *Clay* Kind. I find all theſe *Soils* are alike tending to *Vegetation*, and have their *Salts* proper for it, but in different Proportions of Quantity; that is a Peck of *Clay* has perhaps twice as much *Salts* in it as the ſame Quantity of *Loam*, and that Quantity of *Loam* twice as many *Salts*, as the ſame

Proportion of *Sand*. Now from this Argument of mine, it may ſeem at firſt View that *Clay* is the moſt proper *Soil* to forward the *Growth* of *Plants*, whereas we know that *Sand* is much more apt to produce *Plants* quicker than any other *Soil*; but give me leave to explain this Paradox. *Clay*, whoſe Parts are cloſely wrought together, will not eaſily give out thoſe *Salts* contained in it; neither can the tender *Fibers* of every Plant make their Way thro' it, in Search of their Nouriſhment; but if we open its *Parts*, by digging and breaking it into ſmall Particles, and keep thoſe *Parts* open by a Mixture of ſome ſharp *Sand*, or other Body of the like Nature, we ſhall not fail to ſee the Effects of its Vigour.

On the other Hand, *Sand* is apt to puſh forward the *Plants* growing upon it early in the Spring, and will even cauſe them to *Germinate* near a Month ſooner than the *Plants* growing upon a *Clay*; the Reaſon is that the *Salts* in a *Sand* are at full Liberty, to be raiſed and put in Motion, upon the leaſt Approach of the Sun's Warmth: But then as they are haſty in their Work, ſo are they ſoon exhal'd and loſt.

The *Clay* has certain *Plants* growing upon it, which are natural to it, and conſequently thrive better in it than in any other *Soil.*

And the *Sand* likewiſe has its natural *Plants*, which delight in it, and will not equally proſper in any other *Earth.*

However both the *Clay Plants*, and thoſe of the *Sand*, will grow in the *loamy Soil* I have mention'd, for that it partakes of the Qualities of *Sand* and *Clay*, as Grain doth of *Fleſh* and *Herbs*, in reſpect to the *Food* of *Animals.*

I might here take Notice that the Word *Loam* is variouſly receiv'd, and underſtood by *Planters.* Some mean by it the moſt common ſuperficial *Earth* met with in *England*, without any Regard to the Proportions it bears of *Sand* or *Clay.* Others would have it more inclining to *Clay* than *Sand*; However I ſhall endeavour to avoid all Diſputes that might ariſe concerning it, by once more repeating, that when I ſhall have Occaſion to mention it, I mean only that Degree of *Earth* which equally partakes of *Sand* and *Clay.*

This *Earth* then, which I call *Loam*, may either be of a black, or yellow Colour; but let it be either the one or the other, Experience ſhews us that *Plants* of all Sorts will grow in it, and for the Reaſons I have before mention'd, it appears to be a more beneficial *Soil* than any other where-ever it happens to be found.

Now, as I take it, ſeeing that *Loam* is ſo happy in its Productions, that even *Plants* naturally bred in different *Soils* will thrive in it, it then ſeems reaſonable, that if by Mixtures of *Natural Earths* one with the other, we make ſuch a Compoſt as may nearly imitate it, we may expect far greater Succeſs from a Mixture of that Sort (eſpecially in *Plantations* of durable *Trees*) than any Compoſition we can deviſe to be made with *Dungs*, or other forcing Ingredients. For it is very well worth our Remark, that *Animals*, and *Vegetables* alſo of all Sorts, are more laſting, as they are fed by ſimple and natural *Diets*, as I have hinted before. It is true, *Hot-Beds*, or any other Means of the like Nature, would indeed forward the *Growth* of *Trees*, perhaps as much in one Year, as Nature of her ſelf would do in ſix: Or as Dr. *Agricola* of *Ratisbonne* pretends by his artificial Compoſt to raiſe *Forreſt Trees* to exceed the Height of twenty Foot in a few Days time; but we may be aſſured they can never laſt out half their Days, for we find the ſame in *Animals*, but particularly in *Mankind*, who by Exceſs of unnatural *Foods*, and invigorating *Liquors*, ſhortens his Life; while on the other Hand, ſuch Men as have bare Subſiſtence, and are forced thro' Neceſſity to live upon the natural Food of their own Country,

try, are long-lived; I therefore would adviſe, as well from what I have ſaid, as from the Obſervations and Inquiries I have made of the *Growth* of *Timber Trees*, that they may not be forced by any violent Means, if we deſign them to laſt long and improve themſelves, to be valuable; neither to take them from a Nurſery of rich Ground, and expoſe them afterwards in ſuch *Land* where they may want the ſame plenty of Nouriſhment they have been uſed to; for then they would certainly decline and deceive us. Let the Earth we deſign to plant them in, be freſh and well open'd in its *Parts*; and if it ſhould be ſifted, it will help the ſtriking of young *Roots* at firſt planting, and ſupport them 'till they can gather *Strength*.

I think I need not further explain, that equal Quantities of *Sand* and *Clay* well mix'd together will afford us the deſirable *Soil* we ſeek after, in caſe the *Loam* or *Mother Earth* I mention cannot conveniently be met with. But this has its greateſt uſe, when we make new *Plantations*, for we ought alſo to examine the Depth of the *Soil* underneath, into which our *Trees* are afterwards to puſh their *Roots*, and from whence they are to draw their chief Nouriſhment, and that may be beſt known from Obſervation; that is by examining the moſt vigorous *Trees* of every

very Kind, and obſerving the *Qualities* and *Depths* of the *Soils* they feed from, and from ſuch Examples, to make our *Plantations* accordingly; we ſhall then find that an *Oak* will never make good *Timber*, if it be *planted* or *ſown* upon a ſhallow Rocky *Soil*, and at the ſame time that an *Aſh* will grow there; but this I ſhall more fully explain in the next Chapter of *Forreſt Trees*.

And now ſeeing that ſome delight more in the quick *Growth* of the *Trees* they plant, than the Advantages which would accrue to their Families, from a regular and natural *Growth* of their *Plantations*, I ſhall mention ſome *Mixtures* which have been experienced to forward the *Growth* of *Trees*.

Mixture the Firſt. If the *Soil* be ſtiff inclining to *Clay*, let it be well broke and open'd, of which take about five Load, add to it an equal Quantity of *Heath Turfs* burnt, let theſe Ingredients be well mixed and ſifted, or skreen'd together, after they have lain for a Winter in a *Heap* or *Ridge*. This Compoſt will forward *Trees* extreamly.

Second Mixture. To four Load of *ſtiff Soil* broke and open'd as before, add as many Load of *ſharp Sand*, to which put two Load of the *Aſhes* of *burnt Furzes*, *Gorſe*, *Fern*, *Weeds*, or *Wood*; let this be well mix'd together about *September* or *October*, and be laid up in a *Ridge* 'till the *February* following, to be skreen'd or ſifted for Uſe. Sir *William Bruce*, a Gentleman of *Scotland*, made uſe of the like *Mixtures* in his Garden, with the Succeſs he deſired.

Third Mixture. One Load of *Rotted Wood*, ſuch as may be found under a Wood Pile, or for want of that the ſame Quantity of *Rotted Leaves*. To either of theſe add a Load of *burnt Graſs Turf*, two Load of *Sand*, and the like of *ſtiff Soil*, this Compoſition muſt be well mix'd and laid in a *Ridge* from *October* till *February*, and be ſifted for Uſe. *N. B.* Theſe artificial *Soils*, ſhould always be compos'd about *October*, and ſifted the following Spring juſt before you uſe them; for if you ſhould prepare them in the Spring, the Summers Heat would exhale their *Volatile Spirits*, and beſides *Weeds* would be apt to rob them of their Nouriſhment, unleſs they were to be made in ſome ſhady place under *Trees*.

Fourth Mixture. Take the Quantity of a Load of *Rape Seeds*, after the *Oyl* is preſs'd from them, which may be very eaſily had at the *Rape Mills* at a ſmall Expence; add to them two Load of *Sand*, one of *ſtiff Soil*, and one of burnt *Heath*, or *Graſs Turf*, prepared as the others, and ſifted, will greatly forward the *Growth* of any *Plant*.

Fifth Mixture. Take one Load of *Malt Grains* (after Brewing) add to it two Load of *Sand*, and two of *ſtiff Soil*, mix'd and prepared as before, it will make an incomparable Compoſt to haſten the *Growth* of *Plants*.

Sixth Mixture. Sheeps Dung, with a like Quantity of *Wood-Aſhes*, and twice as much *Loam*, or *Mother Earth*, prepared as before, will greatly forward the *Growth* of *Herbs* and *Trees*.

Seventh Mixture. Take of *Horſe Dung* well conſumed, two Load, add to it one Load of *Turf Aſhes*, two Load of *Sand*, and two of *ſtiff Earth*, prepare this *Mixture* as before, and it will greatly forward *Germination* of *Plants*: But if *Sea-Coal Aſhes* are more eaſily found, put them in the Place of the burnt *Turf*, and then add one Load more of *ſtiff Earth* to the Compoſt.

And now beſides the ſeveral Compoſitions which I have ſet down, I might add thoſe which I have known to have been prepared with the *Soil* of *Poultry*, that feed upon Corn or Grain. I found thoſe Ingredients very hot and full of Salts, greatly tending to *Vegetation*, and abundantly quicker in their Operation, than the *Soil* of *Animals*, which only feed upon on *Herbs*; but that is no great Wonder, if it be true what Sir *Hugh Platt* ſays, that one Load of Grain will enrich Ground more then ten Load of common *Dung*, and alſo from what I know from Experience, and have mention'd in the Fourth and Fifth *Mixtures* preſcrib'd in this Chapter. Now if ſimple *Grain* by Infuſion only (if I may ſo term it) in the *Mixtures* or *Compoſts* I have directed, has a good Effect, we may eaſily imagine how much more powerful it will be when it has paſs'd through the Bodies of *Animals*. I could ſay much more upon this Head, but as it is my Deſign to be as ſhort as may be convenient, and purpoſing chiefly in this Treatiſe to contribute ſuch Experiments as may tend to the Improvement of *Plantations* of *Forreſt Trees*, I ſhall not here enlarge upon *Soils*, but leave ſome Particulars for another Work, and ſum up this Chapter, with two or three ſhort Remarks, firſt that a *Preparation* of natural *Soils* anſwerable to the *Loam* or *Mother Earth* I have mention'd, is certainly the beſt for all Sorts of *Forreſt Trees* to be *planted* or *ſown* in, if we deſign them to make good Timber; and if it is rather deſired that ſuch *Trees* ſhould grow quick, and conſequently be ſubject to decay early, or be prejudiced by *Blights*, I have made mention of ſuch forcing *Compoſts* as will ſet them forward in their *Growth*; but in my Opinion might be better employ'd in Gardens for the Production of ſhort-liv'd *Plants*.

* * *

CHAP. IV.

Of TIMBER-TREES *and* UNDERWOOD, *and of Dreſſing and Cleaning of Woods.*

AS there is nothing which contributes more to the *Honour*, *Beauty*, and *Welfare* of an Eſtate, than timely and ſufficient *Plantations* of *Timber Trees*, ſo I have choſe to make the *propagating* of *Timber* my preſent Subject, and what I have ſaid in the former Chapters may I hope contribute ſomething towards our Succeſs in the Undertaking, which will ſo greatly contribute to the Welfare of every Man of Eſtate, if it be rightly underſtood: For altho' a Gentleman may perhaps be poſſeſs'd of a plentiful Fortune, ſuppoſe of 10000 *l. per Annum*, he ought certainly to conſider that in proceſs of Time he muſt provide Fortunes for Children out of that Eſtate, proportionably to his Honour; and again, his Children muſt likewiſe make farther Proviſions out of their ſeveral Parcels for their Iſſue, and ſo on, 'till at length, in ſix or ſeven Generations, we ſhall find the paternal Eſtate cut to Pieces into ſo many little Shares that there will hardly remain any Idea of the plentiful Stock of their Anceſtors. Now I ſay, it would certainly be a Token of great Wiſdom, for every Gentleman of Fortune, not only to conſult all proper Means how to maintain the Bulk of his Eſtate entire, but continue it ſo in his Line wiſely guarded againſt the Hazards of Fortune, and even the natural Conſequences I mention, by timely and neceſſary *Plantations* upon it, which would be ſo many Monuments of his Wiſdom, and improving Treaſuries for the good of his Poſterity; and beſides how beneficial would ſuch *Plantations* be in Caſe of extraordinary Accidents, the Profuſeneſs of a young Heir; the Diſcovery of Iron or Lead Mines, where Wood is of ſuch extraordinary Uſe; or for the raiſing a Sum of Mony upon any Emergency: I may add likewiſe, beſides the private Intereſt of the Proprietor, it would be of general Uſe, and for the Nation's Good. How happily is *England* ſituated for Trade, what Benefits doth ſhe receive from her Shipping, and therefore how profitable and uſeful is her *Timber*, which will yet become more

Valuable than ever, in that ſo much is continually cut down, and very little Care taken to make new Plantations for future Benefit. In a Word, the preſent State of *Timber* in *England* is ſo very inconſiderable, in reſpect to the great Uſe made of it, and even that which remains growing is generally ſo much neglected in its Culture, that I hope ſome Directions for its Improvement may not be unacceptable to the World.

The *Trees* which have been commonly propagated in *England*, for *Timber*, are the *Oak*, *Aſh*, *Beech*, *Elm*, *Cheſnut* and *Walnut*; theſe are of the upper Claſs, and we may add to them the *Ilex* or *Ever-Green Oak*.

Of the lower Rank for *Underwood*, or more indifferent Uſe, are the *Hazel*, *Alders*, *Willows*, and ſome others of leſs Note.

The *Oak* like all other *Plants* has its Varities, which are taken Notice of by the *Botaniſts*. I have obſerv'd about five Sorts in *England*; but I ſhall only recommend two Kinds of them to be planted for *Timber*. The firſt and beſt in my Opinion is the *Upright-Oak*, which grows more Erect than any other; and the ſecond is the *Large ſpreading Oak*. We have many Inſtances of theſe Kinds that have attain'd to ſuch prodigious Greatneſs of Stature, that the *Timber* alone of one Tree has been ſold for upward of 50 *l*. The *Oak* doth not only afford us the moſt ſerviceable *Timber* for Naval Architecture, but alſo for other Building. Its *Bark* is uſeful to *Tanners*, and the *Oak* is therefore cut down about *April* when its *Bark* will peel. The *Acorns* are excellent Food for Hogs. This Tree delights in moiſt Ground of a good Depth, and will proſper in the coldeſt *Clay*, and, as Mr. *Evelin* ſays, in Gravel alſo. It is noted likewiſe that ſome *Oaks* having been ſown in Hedge Rows, have in the Space of 30 Years born a *Stem* or *Trunk* of a Foot Diameter. I have my ſelf ſeen ſome ſeedling *Oaks* of 20 Years Growth of near that Subſtance, which had never been removed from the Place where they were ſown, and I would adviſe that every Plantation of *Oaks* be ſet from *Acorns* on the very Spot where they are to remain, and that we are likewiſe careful to chuſe our *Acorns* from thriving vigorous Trees, for the Reaſons I have before mention'd; the Diſtance between them ought to be about 33 Foot, and the ſaid Space between the *Oaks* ſhould be interſown or planted for *Underwood*, as I ſhall direct in the following Chapter.

Of the *Aſh* there are two Sorts (falſely diſtinguiſh'd by the Names of *Male* and *Female*) which moſt deſerve our Care in that they are quick Growers, and riſe to a prodigious Stature; beſides theſe there are ſeveral other Kinds which are not worth our Notice. So that we ought to be careful in the Choice of the *Keys* or *Seeds* we deſign to ſow. I have heard of *Aſh* Trees of 40 Years Growth from the *Seed*, that have been ſold for 25 Pounds a-piece, which have grown on Plains in light *Earth*, not very deep, and Mr. *Evelin* tells us, that one Perſon planted ſo much of this ſort of *Timber* in his Life time as was valued worth fifty thouſand Pounds to be bought, which he juſtly remarks was very good Encouragement for a ſmall and pleaſant Induſtry. The *Keys* of this *Tree* are ſowed about *October*, or elſe may be laid at that time in *Sand*, *S. S. S.* 'till the following Spring, and then ſown. The *Timber* of the *Aſh* is uſed for Ploughs and Axel-trees, Wheel Rings, Oars, and many other mechanick Works, and if we propagate the *Aſh* for *Underwood* only, it will turn to good Account for Hoops and Hop-Poles. It may be cut about *February*.

The *Beech* delights in Mountains. In *Berkſhire* in the *Chalky* Hills this Tree is very proſperous, and attains a conſiderable Stature; its *Timber* is uſed about Keels of Ships, and many Implements of Huſbandry; it is the moſt common *Fire-wood* of *England*, eſpecially about *London*, where Billets are uſually burnt. Among the Coal-Pits near *New Caſtle upon Tine* this Wood is much uſed to make Cart Ways, where for many Miles the Wheels of the Coal-Waggons run upon it, which ſaves the Expence of Horſe Fleſh. This Wood will remain ſound for many Years, in thoſe marſhy Lands, and is much eſteem'd for that uſe. From the *Seed*, which is call'd *Beechmaſt*, the *French* have long ſince drawn a very ſweet *Oil* for eating, and lately the ſame has been practiſed in *England*. This *Seed* is likewiſe good to feed *Deer*, *Hogs* and *Fowl*; it may be ſown about *October*, or put in *Sand* like the *Aſh-Keys*, 'till Spring, the better to preſerve it from *Vermin*. The *Timber* may be cut as the former.

We have many Sorts of *Elm* frequent in *England*, among which the *Vulgar* or *Mountain Elm* is counted the beſt for *Timber*; I ſhall therefore recommend this *Sort* to the Planter, before all others. It may be propagated from the *Seed*, or *Samera*, which ripens and falls from it towards the latter End of *April*, or Beginning of *May*, it muſt then be ſown in fine ſifted *Earth*, or what I call *Loam* in the foregoing Chapter. This *Seminary* muſt be made in a ſhady Place, and water'd from time to time, as the *Earth* begins to dry; but beſides this way of raiſing *Elms*, we may either propagate them from *Layers*, or *Suckers*; which laſt muſt be tranſplanted into *Beds* of fine *Earth* about the Beginning of *March*, and kept well water'd. And ſo naturally is the *Elm* inclined to *Vegetation*, that I have heard ſome affirm, by ſowing only the *Chips* of it in a Piece of plow'd Ground, they have rais'd a large Quantity of theſe Trees, which perhaps is not impoſſible; for I am aſſured in other Caſes the *Buds* and *Leaves*, nay the very *fibrous Roots* of *Plants* have been made to *vegetate* and produce Trees; as for Example, the ſingle *Leaves* of *Oranges* have been made to ſtrike *Root*, and produce *Branches*, *Leaves*, *Flowers* and *Fruit*, by ſetting them half way in the *Earth*, and Mr. *Fairchild* of *Hoxton* has done the like with *Leaves* of the *Lauruſtinus*; however let us raiſe our *Elms* which way we will, I ſhall adviſe that they be not *planted* out of their firſt *Beds* 'till they have ſtood there two Years; and then remove them to greater Diſtances from each other, and let them ſo remain 'till you plant them out for good, at about 20 Foot Diſtance, in *Beds* of the ſifted *Loam* directed, they grow quick, give a fine Shade, and afford valuable *Timber*; and if the *Witch Elm*, or *Dutch Elm* be grafted upon this Kind, we may expect them to make *Shoots* of above 8 Foot long in one Year, and produce *Leaves* of an extraordinary Bigneſs, but the Wood will then be not ſo valuable. This Tree delights in an *Earth* competently fertile, neither too dry or ſandy, or too cold and ſpungy; nor does it require a deep *Soil.* Let it be moderately refreſhed with Water after *planting*; and to keep the *Earth* about the *Roots* more open, and ready to receive Wet, cover the *Bed* it is *planted* in with rotted *Fern*, or other ſuch like Matter. A Year or two after *planting*, you may refreſh the young *Fibers* at the Extremities of the *Roots* with ſome fine ſifted *Earth*, or any one of the four firſt *Mixtures* mention'd in the foregoing Chapter, which will make the Tree ſhoot prodigiouſly, for that they contain *vegetable Salts* in great abundance. The *Timber* of this *Tree* is very ſerviceable, eſpecially where it may always lye wet it will laſt a long time; it is mightily uſed for Pipes, Pumps, Mills, and ſuch Parts of Ships as lye conſtantly under Water; in a Word it is almoſt of general Uſe. The time of Felling it is from *November* to *February*.

We have two Kinds of *Cheſnut* in *England*, that which bears *Edible Fruit*, and the other which is call'd the *Horſe-Cheſnut*: The firſt of theſe Trees affords good *Timber*, and the Latter is only deſirable for its pleaſant Shade and beautiful Flowers; theſe *Trees* may both be raiſed by ſetting the *Nuts* about three Inches deep, in a light ſandy *Soil*, towards the latter End of *February* or Beginning of *March*; but as the firſt only is uſeful, ſo I ſhall chuſe to recommend it to the *Forreſter*. It delights in high Grounds remote from Water, which would ſpoil both its *Timber* and *Fruit*, and ſhould indeed be ſet from the *Nut*, where it is always to remain, for it's apt to ſuffer greatly by removing, and ſpread too much in its Branches, when it loſes its *Tap-root*, as all other *Tap-rooted* Trees are known to do. Its *Timber* is laſting if it be kept dry, and good for Building; and if it be planted for *Underwood*, it will afford excellent Poles and Stakes in nine Years after ſowing, worth at leaſt 10*s.* *per* Hundred: The *Fruit* is ſometimes uſed at our Tables, but more commonly given to *Deer* and other Cattle to fatten them. We may fell this *Tree* any time between *November* and *February*.

Among the *Botaniſts* there are reckon'd many ſorts of *Walnuts*, two only of which I ſhall recommend to the *Planter*, viz. That with the *ſoft Shell* for the ſake of the *Fruit*, and that with the *black Grain* for the Goodneſs of its *Timber*; they are both rais'd from the *Nuts* like the *Cheſnut*, and ſhould like them be ſown in the Places where they are to remain. They are in great Danger of Death if they loſe their *Tap-root*, but will thrive extreamly if they have Depth of Earth to ſtrike into. The *Walnut* grows well in *Loam*, but will flouriſh alſo in *Chalk* or gravelly *Soil*, either on hilly Ground or in a Vale, which (I think) ſhews it to be a foreign *Plant*, for as I have obſerv'd every *Plant* natural to *England*, has a *Soil* and *Expoſure* peculiar to it ſelf, and will ſcarce be made to grow in any other Sort of *Land* or *Situation*. I have ſeen ſome *Walnut* Trees of forty Years *Growth* from the ſetting of the *Nuts* that were valued at five Pounds apiece, and others ſtanding by them which were Trees planted at the ſame time (as the Owner himſelf inform'd me) that were not worth thirty Shillings a Tree; and the like Obſervation has been made of other *Tap-rooted* Trees, but particularly the *Oak*, ſo great is the Difference of *Growth* in downright Rooted *Plants* when they are ſet from *Acorns* or *Nuts*, and *tranſplanted* from the *Nurſery*. The *Timber* is much uſed for Chairs, Cabinets and Houſhold Furniture; it is durable, and an Enemy to Worms, from its exceeding Bitterneſs. The *Nuts* yield abundance of Oil, and take Place among the beſt *Fruits* for the Table. This *Tree* may be cut down when the *Sap* is fix'd, *i. e.* from *November* to *February*.

The *Ilex* or *Evergreen Oak*, is a *Plan* which produces admirable *Timber*, but is more particularly valuable for its *Knee Timber*, which is much tougher than that of our *Engliſh Oak*; it is in ſuch Requeſt among our Ship-Carpenters that many Ships lading of it has been brought to *England*. The *Tree* is of quick *Growth*, and will attain to a very conſiderable height, even to equal the talleſt of the *Engliſh Oaks*, to which Perfections we may alſo add the Beauty of its *Leaves*, which are green all Winter.

That curious Gentleman *Robert Balle*, Eſq; *F. R. S.* has among other Improvements for the Good of his Country propagated a large Parcel of theſe *Trees* in *England*, ſome of which have in about 30 Years Space grown to a conſiderable Greatneſs of Stature. And it is to be wiſh'd that others would follow his Example in the Culture of this beautiful and profitable *Tree*. This Gentleman has rais'd ſome thouſands of them from *Acorns*, and tranſplanted them with Succeſs and great Judgment; and to follow his Method, we muſt ſet the *Acorns* in *Loam* well ſifted, in Garden Pots in *February*, and turn them out with the Earth about their *Roots* when they are two Years *Growth*, to tranſplant them afterwards at proper Diſtances, where they are to remain. Theſe, like our *Engliſh Oaks*, are *Tap-rooted*, and therefore delight in deep *Soil*, they proſper in moiſt Land, rather on a Plain, than on hilly ground. If we conſult the *Anatomy* of *Plants*. we ought to be very careful not to injure their *Tap-roots*, which are always anſwerable to the *leading Shoot* on the *Top* of the *Tree*; it is therefore reaſonable to believe that a *Plant* by loſing that *downright Root*, is in Danger of loſing alſo the *Top-Shoot*, which is fed from it. And altho' a Tree may ſtrike freſh *Roots* after the *Amputation* of this *leading Root*, yet we may find by Experience that the *Sap* will then puſh forth *Branches* in the Sides of the *Stem*, and diſcontinue its upright *Growth*. We may fell this *Tree* as we do the other *Oak* for the ſake of its *Bark*, the *Acorns* are good Food for *Deer*, and *Fowl*, which greatly delight in the Shelter of theſe *Trees*.

Having mention'd the moſt valuable *Trees* for *Timber*, I am in the next Place to take Notice of ſuch others as will afford us the moſt valuable Crops of *Underwood*. I have already obſerv'd that the *Aſh* and *Cheſnut* may be order'd in this Manner, and bring conſiderable Returns to the Proprietor. The next which I ſhall propoſe for this Uſe is the *Hazel*, which if it be rightly managed will turn to good Account in *Coppices*. This *Plant* may be raiſed from the *Nuts* ſown a little after they are ripe, in cold, dry, ſandy Ground; but if the *Land* happens to be more inclin'd to *Clay*, plow it in *Autumn*, and let it mellow with the Froſts 'till *February* before you ſow them. The learned adviſe that after the *ſeedling Plants* are come up, they ſhould be weeded or hough'd ſo as to leave the *Plants* at three Foot Diſtance from each other, and after three Years *Growth* to cut them off within half a Foot of the Ground, by which Means they will be made to ſhoot forth many *Twiggs* from each *Stem*, which in nine Years time (*i. e.*) twelve from putting in the *Seed*, will be fit to cut for Hop-Poles, Hoops, Fagots, and other ſuch uſes; but if you rather chuſe to uſe them for Hurdles, then they may be cut at five Years *Growth*. After the firſt Cutting, you may cut again in ſeven or eight Years, if they like the Ground, for Poles and Hoops as before, and ſo continue to do from time to time, as you ſee Occaſion. But theſe *Trees* may be likewiſe propagated by *Suckers*, which are frequently found growing about the *Roots* of Old Trees, but are not very certain in their *Growth*, after tranſplanting, unleſs they are carefully water'd till they have ſtruck good Roots. In a Plantation of this Kind, which may be made at any time between *October* and the Beginning of *March*, when the Weather is open, theſe *Suckers* muſt be ſet at three Foot Diſtance, and cut down within half a Foot of the Ground about the Beginning of *April* following; or they may alſo be propagated by laying down their *Branches* or *Twiggs* about three Inches in the Earth, which will furniſh us with abundance of young *Plants* in a Year's time. This Work muſt be done about *October*.

The next I ſhall treat of is the *Willow*, an *Amphibuous Plant*. There are many Sorts of it diſtinguiſh'd by the *Botaniſts*, which ſhould I mention here by their ſeveral Names, I might perhaps perplex my Reader, and ſhall therefore only mention them as two Kinds, firſt the *Oziers*, which afford Twigs for the Basket-makers, and binding Rods, and ſecondly the Tree Kind or *Withy*.

Firſt then the *Oziers*, which afford us *Twiggs* for *Wicker-works*, are raiſed by ſetting *Slips* of two or three Years *Growth* about a Foot deep in marſhy or wet *Ground*, at two Foot diſtance from each other; this *Work* is beſt done about the middle of *February*, if the Weather be open; the ſecond Year after *Planting* they may have their *Tops* cut off, leaving their *Stems* about a Foot above Ground, ſo will they put forth *Twigs* which muſt be again cut down early the *Spring* following, which *Work* being continued every *Year*, the Owner will find conſiderable Advantage from ſuch *Plantations.* An Acre of Ground thus managed will turn to better *Account* than the like parcel of *Land* ſown with *Wheat* or any Grain whatever, and it may be for this Reaſon that ſome would pretend to raiſe vaſt Sums of Money by planting ſeveral thouſand *Acres* in this way, as I have been informed ſeveral Gentlemen propoſe to do. It is certain at preſent *Oziers* turn to good *Account*, but I am of Opinion that if we had only as many more planted as we have now growing in *England*, the Markets would be over-ſtock'd with them, and their Price would fall. And beſides, every *Ground*, as I have ſaid before, will not produce them. In this Treatiſe may be found the ſeveral ſorts of *Trees* for Uſe, the different *Lands* they require for their Welfare, and the vaſt Returns they would bring in, if large *Plantations* were made of the ſeveral kinds, by a Diſcreet Planter, who knew how to allot to every *Soil* the *Tree* proper for it. But I ſhall proceed now to give ſome Directions for the propagating of the large *Withy* or

Tree kind, which will alſo in a few Years time afford profitable, though not very durable *Wood.* Its Uſe is for Perches, Rake-tales, and ſuch like. *Branches* of three or four Years *Growth*, about twelve Foot in length, being ſet near two Foot deep in the Ground in *February*, about fifteen Foot aſunder, will ſoon make handſome *Trees*, which will bear *Lopping* every fifth Year; theſe love wet Ground, and will not be made to proſper in any other. I might add, that this and ſeveral other ſorts of *Willow* might be rais'd from *Seeds* which are born on the *Female Juli*, if we *ſow* them in wet boggy Ground, as is practiſed in *France* and other Countries.

The *Alder*, more than all other *Trees* beſide, delights in *Boggy Places*, and may be cultivated in the coldeſt wet Grounds. This *Amphibuous Plant* is beſt raiſed from *Truncheons* or *Branches* about three Foot in length, ſetting them about *February* a Foot deep in the Ground; they thrive exceedingly on the Banks of Rivers, and will make ſuch *Shoots* in three or four Years time, as may be then cut and ſold to good Advantage for *Poles* and other Uſes; it is a laſting *Wood* if it lie continually under Water, and if we believe *Joſ. Baubinus*, will in courſe of time turn to *Stone*, but if it be expoſed ſo as to be ſometimes wet and ſometimes dry, it is of no Duration. This *Plant* is alſo raiſed from *Seeds* in *Flanders*, where they make great Profit of it.

Thus have I given a ſhort View of the ſeveral ſorts of *Trees* which I would recommend to be planted for *Timber* and *Underwood*; I have endeavour'd to aſcertain the ſeveral *Soils* and *Situations* proper to each of them, which I hope may be of ſome uſe, for that in the Quantity of an Acre of Ground we find *Earths* of very different *Qualites*, to any of which one or other of the *Trees* I have named may be allotted. And now as I ſuppoſe that every Gentleman who is about to make a *Plantation*, will certainly make it upon his own *Land*, or at leaſt on ſuch a Parcel of Ground as will by right be continued after his Demiſe in his Family, it is reaſonable enough to believe, that ſuch Perſons may have upon their Eſtates ſome *Timber* already growing, ſome *Trees* proſpering, others decaying: Now I ſay it would ſurely be good Husbandry to fell ſuch *Trees* as begin to decline, either from too great Age, or too near Neighbourhood with others.

To the firſt, I can pretend to give no other Direction than to have them cut down at the proper *Seaſon*; but to the ſecond, (*i.e*) where they grow too cloſe together, leave the moſt thriving *Trees* to grow and improve themſelves, and cut up the others *Root* and *Branch*, leaving convenient Diſtances between the *Trees* which remain ſtanding, which ought to be only ſuch as have their *Tops* or *leading Shoots* proſperous and in good order. Our Countryman *Lawſon*, who had for above 40 Years ſtudy'd the Improvement and Management of *Woods* and *Timber Trees*, has given us a very good Leſſon concerning the *dreſſing* and *cleaning* of *Woods*, which being ſhort, and much to the purpoſe, I ſhall inſert in his own Words.

" How many *Forreſts* and *Woods*, " wherein you ſhall have for one *thriving* " *Tree*, four (nay ſometimes twenty four) " *evil thriving*, rotten and dying Trees, " even while they live; and inſtead of " *Trees*, thouſands of *Buſhes* and *Shrubs!* " What *Rottenneſs*, what *Hollowneſs*, " what *dead Arms*, *wither'd Tops*, *curtail'd Trunks*, what loads of *Moſs*, " *drooping Boughs*, and *dying Branches* " ſhall you ſee every where, and thoſe " that are in this ſort, are in a manner " all unprofitable *Boughs*, *canker'd Arms*, " crooked, little and ſhort *Boals*. What " an infinite Number of *Buſhes*, *Shrubs*, " and Skrags of *Haſels*, *Thorns*, and other unprofitable *Wood*, which might be " brought by dreſſing to become great " and goodly Trees! Conſider now the " Cauſe.

" The *Leſſer Wood* hath been ſpoiled " with careleſs, unskilful, and untimely " *Stowing*; and much alſo of the *Great* " *Wood.* The *greater Trees* at their firſt " riſing have fill'd and overladen them- " ſelves with a Number of *waſtful Boughs* " and *Suckers*, which have not only drawn " the *Sap* from the *Boal*, but alſo have " made it knotty, and themſelves and " the *Boal* moſſy for want of *Dreſſing*; " whereas, if in the prime of *Growth* " they had been taken away cloſe all but " one *Top*, and clean by the *Bulk*, the " ſtrength of all the *Sap* ſhould have gone " to the *Bulk*, and ſo he would have " recover'd and cover'd his *Knots*, and " have put forth a fair, long, and ſtreight " *Body* for *Timber* profitable, huge great " of *Bulk*, and of infinite Laſt.

" If all *Timber Trees* were ſuch (will " ſome ſay) how ſhould we have crooked " Wood for *Wheels*, *Coorbs*, *&c.*

" *Anſwer*, Dreſs all you can, and there " will be enough *crooked* for thoſe Uſes.

" More than this, in moſt places they " grow ſo thick that neither themſelves " nor *Earth*, nor any thing under or near " them can thrive, nor *Sun* nor *Rain* nor " *Air* can come at them.

" I ſee a Number of *Hags*, where out " of one *Root* you ſhall ſee three or four " (nay more, ſuch is Men's unskilful

" greedineſs, who deſiring many, have
" none good) pretty *Oaks* or *Aſhes* ſtreight
" and tall; becauſe the *Root* at the firſt
" *Shoot* gives *Sap* amain: But if *One* only
" of them might be ſuffer'd to grow, and
" that well and cleanly pruned all to his
" very *Top*, what a *Tree* ſhould we have
" in time, and we ſee by thoſe *Roots* con-
" tinually and plentifully ſpringing, not-
" withſtanding ſo deadly wounded, what
" a Commodity ſhould ariſe to the *Owner*
" and the *Commonwealth*, if Wood were
" cheriſh'd and orderly dreſs'd. The
" waſte *Boughs* cloſely and skillfully ta-
" ken away, would give us ſtore of *Fences*
" and *Fuel*, and the *Bulk* of the *Tree* in
" time would grow of huge length and
" bigneſs.

And now from what has been ſaid relating to the Cleanſing, Dreſſing and Pruning of *Woods*, two Things naturally offer to the Benefit of the Proprietors: *Firſt*, That the Profit which will accrue from the fall of diſtemper'd and dedecaying *Timber* and *Underwood*, will afford a Sum of Money ſufficient to make large *Plantations:* And *Secondly*, the *Trees* which remain ſtanding after this Weeding is perform'd, will grow and proſper exceedingly, by being then at liberty to receive a greater quantity of *Nouriſhment* from the *Earth*, and by enjoying ſuch a Proportion of *Air* as their Age and Strength will require.

CHAP. V.

The Method of planting an Acre of Ground *with* TIMBER-TREES *and* UNDERWOOD; *with the* Profits *which will ariſe from that* Plantation *in nine Years, ſeventeen Years, and twenty five Years after* Planting.

IF we conſider the many Advantages this Nation in general has receiv'd from the *Timber* of its own *Growth*, how by its powerful Fleets (the Off-ſpring of its *Oaks*) *England* has gain'd the Dominion of the Seas, and now enjoys the Benefits of an Univerſal Commerce; without mentioning the Advantages it affords to every particular Owner of it; It is wonderful to me, that the propagating of *Timber*, a Commodity ſo Valuable and Ornamental, ſhould be ſo little encouraged now-a-days among us, when our natural *Store* is ſo near being conſumed, that to all appearance in a few Years time we may be forced to ſeek it in foreign Countries.

Now, if I may be allow'd to judge in this caſe, I conceive that the preſent decay of our *Timber* may depend upon one or other of the following Reaſons.

Firſt, That the making *new Plantations* will be an *immediate Expence* to us: Or,

Secondly, That we cannot hope to reap any *Profit* to ourſelves from ſuch *Plantations* as might be made in our *times*; or elſe,

Thirdly, That many Gentlemen who are already Maſters of *Woods*, receive little *Profit* from them for want of due Care and Management.

The firſt and laſt of theſe Objections are anſwer'd, I think, in the foregoing Chapter, where the Advantages of Cleaning and Dreſſing of *Woods* are ſet down; in that not only *Money* is provided thereby to anſwer the Expence of *New Plantations*, but alſo the ſtanding *Trees* will be put into a thriving Condition.

It remains now for me to anſwer the other Objection, *viz.* That we cannot propoſe to reap any *Profit* to our ſelves from the *Plantations* which might be made by us. But I hope the Method which I ſhall herein propoſe, will give full Satisfaction to that point.

For which end I would recommend that every *Plantation* which ſhall be made either in this preſent Age or hereafter, may conſiſt partly of *Forreſt* or *Timber-Trees*, and partly of *Copice* or *Underwood.*

Now the *Underwood* which I propoſe to be planted and intermix'd among the *Timber Trees* or *Standards*, may be cut in eight or nine Years after Planting, and ſo from time to time every eighth Year will produce a very conſiderable Return, as will appear hereafter in a ſtated Account.

Secondly, The *Plants* for *Underwood*, which will encompaſs on every Side the young *Timber Trees*, will not only ſhelter them from Blaſts of Wind which might be hurtful to them, but will alſo (by keeping off the circum-ambient Air) draw them into ſtrait and tall *Trees*, 'till they can ſhift for themſelves, and are ſtrong enough to bear the Severity of the Weather.

But to proceed, let us make choice of ſuch Ground to plant upon, as may not be thought proper for Corn, or at leaſt ſuch as will yield only a poor Crop of Grain. I ſuppoſe ſuch Land will be worth about five Shillings *per* Acre by the Year, and by all Means let it be, if poſſible, near ſome Navigable River, for the greater Eaſe and Cheapneſs of Carriage. Now as I have before hinted that as the Land is, ſo muſt we allot the proper *Plant* for it, I only wiſh it may be deep enough to nouriſh the *Oak* and *Ilex*, which are *Tap-rooted Plants*, and therefore delight in deep Soil.

Suppoſing then we are fortunate enough to meet with an Acre of Ground proper for *Oaks*, we muſt firſt encompaſs it with a good Fence, and then either dig or plough the Land at a proper Seaſon, to lye Fallow for ſome time, 'till the *Turf* be mellow'd and fit for our Purpoſe.

An *Acre* of Ground contains 160 Square *Perch* or *Rods*, each Rod being 16 Foot and a half. This Quantity of Land muſt be fenced about with a Ditch ſix Foot wide, three Rows of *Quickſetts* planted upon the Sides of its Banks at a Foot Diſtance from each other, and a dry Hedge on the Top.

A Labouring Man working for *one Shilling per diem*, may prepare nine Foot of the Ditch in length in one Day, and cut Stakes and Buſhes and make about five *Rod* of the dry Hedge in a Day, ſo that he may prepare the Hedge, make the Ditch, plant three Rows of *Quickſets*, and pay the Expence of them after the Rate of *two Shillings per* Hundred, for about *three Shillings* the *Perch*; ſo will the whole Charge of making a Fence about an *Acre* of Land be *Seven Pounds Sixteen Shillings*; but we may fence in two *Acres* of Land after the ſame Rate, being 32 Perch long, and ten Perch wide, for *nine Pounds ſix Shillings*, for the ſame Reaſon that if *one Hundred Hurdles* will hold a *thouſand* Sheep, *two Hurdles* added to them will fold *two thouſand* Sheep, that is if the Sheep Pen has 49 *Hurdles* on each Side, and *one* at each End, it juſt contains half the Quantity of Ground that it would do, if it had the Breadth of *two Hurdles* at the Ends. *N. B.* A *Pole* or *Perch* planted with three Rows of *Quickſetts* will take up about 48 *Plants*, ſo will there be required to plant about an *Acre* 2496 *Plants*.

Thus having provided a good Fence to defend our young *Plantation* from Dangers of Cattle and other Inconveniencies, the next thing to be done is to prepare the encloſed Land for *Planting*, which may be perform'd ſeveral Ways.

Suppoſing the Land to be encumber'd in the worſt Manner with *Buſhes*, *Whinns*, or *Furze*, &c. ſo that a Plow cannot be uſed upon it, then may it be dug and clean'd for about *Sixpence* the ſquare *Pearch*; the whole *Acre*, if it be dug at that rate, will come to *four Pounds*. But if the Ground ſhould happen to be in that State that a Plough can work in it, an *Acre* may be plow'd for about *twelve Shillings*.

The Land being thus prepared, one *Acre* will contain forty Plants of *Oak* at 33 Foot Diſtance, and as I have hinted before that all *tap-rooted* Trees are endanger'd by removing, and that when they are *tranſplanted* they ſeldom come to the Perfection of thoſe which are raiſed from *Seed*, and remain always in the ſame place; I ſhall therefore recommend that forty *Beds* of good Natural *Soil* be prepared on the *Acre* of Land at the aforeſaid Diſtance of 33 Foot from each other, and that in each *Bed* five or ſix *Acorns* be planted about four Inches deep in *February*, which Seaſon I chuſe rather than *Autumn*, becauſe the over wet of ſome Winters might rot the Seeds, or *Mice*, *Squirrels*, and ſuch like Animals might deſtroy them.

Theſe forty *Beds* may well be prepared by one Man in three Days, at *one ſhilling per Diem*, two hundred *Acorns* may be worth about *ſix pence*, and the planting of them be worth about *ſix pence* more, which makes in all *four ſhillings*.

The *Acre* of Land being thus ſown with *Oaks*, we may Interſow the remaining part of the Ground with *Aſh-Keys* which have been kept the Winter in dry Sand, theſe will turn to very good account for *Underwood*, and the Land is already dug or plow'd for our purpoſe.

One Buſhel of *Aſh Keys* may be worth *two Shillings*, the ſowing them *one Shilling*, and the Harrowing the Ground after Sowing will be worth *five Shillings* more, in all *eight Shillings*. The *Acorns* and *Aſh Keys* will come up the firſt Year, and muſt be hough'd and cleans'd from Weeds. One Man may do this Work in three Days, leaving the Diſtance of three Foot between the *Aſhen Plants*, the Expence of this weeding will be *three Shillings*, for I rate a Man's Work at *one Shilling per Diem*, becauſe I ſuppoſe ſuch *Plantations* will only be made in thoſe Places where Land is cheap, and conſequently every thing elſe is valuable in Proportion.

The ſecond Year we may draw ſome of the young *Oaks*, leaving a ſingle *Plant* in each *Bed*; now it is likely that all the *Acorns* which were put into the Ground may not come up, therefore I would adviſe as the ſureſt way to have our Expectations anſwer'd from the *Seeds* we ſow, to try the Goodneſs of them before they are ſown, which may be done by putting them in Water, and planting only thoſe which ſink quickly to the Bottom.

An *Acre* of Land thus *fenced*, *dug*, *cleanſed* and *planted*, comes to *twelve Pounds* and *eleven Shillings*, and *two Acres* dreſſed and planted in like manner will coſt *eighteen Pounds ſixteen Shillings*.

But if the Land be clean enough to admit the Plow, then the Charge of *fencing, planting,* &c. of one *Acre,* will be *nine Pounds three Shillings,* and the Expence of *two Acres* dreſs'd in the ſame Manner, *twelve Pounds.*

In nine Years after this *Plantation* has been made, the *Aſh Plants* will be fit to cut for *Poles* or *Hoops,* worth upon the Place *ten Shillings per Hundred:* If the *Plants* ſtand at a Yard diſtance from each other, the *Acre* of Land will then contain about 4800 *Plants,* which may be ſold for *twenty four Pounds.* The *Quickſet* Fence muſt likewiſe be cut down, and will yield about ten Load of Buſhes, we will ſuppoſe them only worth *five Shillings per* Load; altho' near *London* they ſell for four times as much.

The whole Charge of *fencing, digging* and *Planting* an *Acre* of Land with *Oaks* for *Timber* and *Aſh* for *Underwood,* with the Profit of the firſt nine Years *Growth* may be ſeen in the following Account.

Account of the nine Years after Planting, or Firſt Cutting.

	l.	s.	d.		l.	s.	d.
Expence of fencing, digging and ſowing an *Acre* of Land for *Timber* and *Underwood*,	12	11	0	Received for 4800 *Aſhen Poles*, at 10 *Shillings per hundred.*	24	0	0
Intereſt of the aforeſaid Sum for 9 Years, at 5 *per Cent.*	5	12	6	Receiv'd more for 10 Load of Buſhes, at 5 *Shillings per* Load.	2	10	0
Rent of the Land for 9 Years, at 5 Shillings *per Acre, per Annum.*	02	05	0	Nine Years Gain.	26	10	00
For cutting 4800 *Aſhen Poles*, one Man 5 Days at *one Shilling per Diem.*	0	05	0	Nine Years Expence.	20	13	06
9 Years Expence.	20	13	6	Neat Profit of the *Plantation* in 9 Years.	5	16	06

After this Cutting we may cut again in eight Years time, and expect 4 or 5 Poles on each *Aſhen Plant.*

Account of the 17 Years after Planting, or Second Cutting.

	l.	s.	d.		l.	s.	d.
Rent of the Land for 8 Years at 5 *Shillings per Annum.*	2	0	0	Receiv'd for 19200 *Aſhen Poles*, at 10 *Shillings per hundred.*	096	0	0
Expence of Cutting 19200 *Aſhen Poles* (reckoning four to each Plant) one Man 20 Days at *one Shilling per diem.*	01	0	0	Receiv'd more for 10 Load of Buſhes at 5 *Shillings per* Load.	02	10	0
17 Years Expence.	3	0	0	Gain'd clear of Expences by the firſt cutting.	05	16	06
				The Intereſt which might be gain'd on 5 *l.* 16 *s.* 6 *d.* in eight Years at five *per Cent.* is about	02	06	0
				17 Years Gain.	106	12	06
				17 Years Expence.	003	00	00
				Neat Profit of the *Plantation* in 17 Years after planting.	103	12	06

Account of the twenty five Years after Planting, or Third Cutting.

	l.	s.	d.		l.	s.	d.
Rent for 8 Years, at 5 *Shillings* the *Acre per Annum.*	02	0	0	Receiv'd for 19200 *Aſhen Poles* at 10 *Shillings per hundred.*	96	0	0
Expence of Cutting 19200 *Aſhen Poles*, one Man 20 Days at *one Shilling per diem.*	01	0	0	Receiv'd for ten Load of Buſhes at *five Shillings per* Load.	002	10	0
				Gain'd clear of Expences by the ſecond Cutting.	103	12	6
				The Intereſt which might be gain'd on the aforeſaid Sum in 8 Years at 5 *per Cent.*	41	8	0
25 Years Expence	3	0	0	25 Years Gain.	243	10	06
				25 Years Expence.	003	00	00
				Neat Profit of the *Plantation* in 25 Years.	240	10	06
				To which we may add the Value of the 40 *Oaks* then growing in the ſaid *Plantation*, worth 10 *Shillings per Tree.*	20	00	00
				In all.	260	10	06

By the foregoing Account we find that an *Acre* of Land, planted as I direct, may produce the Sum of 260*l.* 10*s.* 6*d.* in the ſpace of *twenty five Years*, clean of all Expences of Planting, and Value of the Land, and the *Oaks* if they are ſtill continued growing, will yet produce a more conſiderable return to the *Owner*, or his *Family* after him.

By the Example of this *Plantation*, others may be made with different kinds of *Trees*; and if the Planter has a due regard to the *Soils* proper to what he deſigns to plant, he may expect a return for his Labour and Induſtry anſwerable to what I have mentioned in this Account, and if his Ground happens to be already *fenced* for his Purpoſe, and is capable of admitting a Plough upon it, he may yet reap a much more conſiderable Profit from his *Plantation.*

I ſhall now conclude this Treatiſe with acquainting my Reader with what he is to expect in the Second Part; I purpoſe in that to treat of every thing (ſo far as my Experience will permit) which may tend to the Improvement of the *Parterre* or *Flower Garden*; wherein I ſhall firſt give the Explanation of a new Invention, for the more ready deſigning and laying out of *Garden Platts*, by which *Inſtrument* it will be poſſible to produce more Variety of *Figures* for *Gardens* in an Hours time, than we can find in all the printed Books now extant: I ſhall then give my Reader the beſt Methods of raiſing and propagating all ſorts of Flowers: And laſtly, endeavour to preſcribe ſuch Rules for the adorning of *Gardens*, as may make them delightful in every Month of the Year. And now that this Work may be the more compleat, I deſire all curious Gentlemen will communicate to me what new Experiments they have made in Planting and Gardening, directed to the Publiſher of this firſt Part, which Favours I ſhall gratefully acknowledge, and inſert in the ſucceeding Sheets.

FINIS.

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